C: Pete W. PRO

Thompson Creek
Mining Company

AIR QUALITY OPERATING PERMIT RENEWAL APPLICATION

Sherry Davis 0272 TWT

Facility:
Thompson Creek Mine

Submitted to:
Idaho Division of Environmental Quality
Air Quality Permitting Bureau
1410 N. Hilton
Boise, Idaho 83706

Tues 8:30 - 5:00
Wed " "
Thurs 8:30 - 1:30

Submitted By:
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PO Box 62
Clayton, Idaho 83227

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Department of Environmental Quality
State Air Program

April 4, 2006

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Air Quality Impact Analysis for the Thompson Creek Mine

Thompson Creek Mining Company
Clayton, ID

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RETEC Project Number: TCMC1-19116-200

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March 2006

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1 Introduction and Background

This document is the Thompson Creek Mining Company's renewal application for a Tier II operating permit for the Thompson Creek Mine. This application is submitted to the Idaho Division of Environmental Quality (IDEQ). The Thompson Creek Mine is a molybdenum disulfide mining, milling, and concentration facility located in Custer County, Idaho. The facility is currently following the conditions of Tier II Operating Permit No. 37-00001 and is in compliance with this permit. Ownership and control of the Thompson Creek Mine has not change from the issuance of Tier II Operating Permit No. 37-00001.

The following sections of this renewal application summarize the Thompson Creek Mine Project from mining of ore and over burden to the final product. In applying for previously issued air quality permits, the Thompson Creek Mining Company (TCMC) has submitted to IDEQ a substantial amount of technical information describing the equipment and processes associated with the facility. As requested by IDEQ, TCMC is providing a summary of this information in this application document. To keep the size of this document manageable, TCMC is not resubmitting copies of previously supplied information (i.e. source test reports) with this application. Hence, TCMC requests that, whenever possible, IDEQ staff obtain equipment information and specifications that may be available in IDEQ files. Should IDEQ require additional information to conduct determinations or evaluations required by Idaho air quality regulations, TCMC will provide IDEQ with the relevant information in TCMC's possession.

This application includes an emission inventory, including emission factors and process data for the entire facility. This inventory includes all point sources and fugitive sources. The emissions inventory along with a description of each source is located in the Appendices of this document.

An air dispersion model for the facility demonstrating compliance with all ambient standards was developed for this application. The modeling protocol was submitted to IDEQ and the protocol was approved by IDEQ via e-mail dated March 23, 2006 from Kevin Schilling, IDEQ Stationary Source Air Modeling Coordinator to Pete Miller, The RETEC Group. A copy of the modeling report and results can be found in the Appendices of this document.

A completeness determination was conducted for this application. The determination was made by TCMC staff and is found in section 4 of this document.

2 Facility Location

The Thompson Creek Mine is located in Custer County, Idaho, refer to the Figure 1 below.

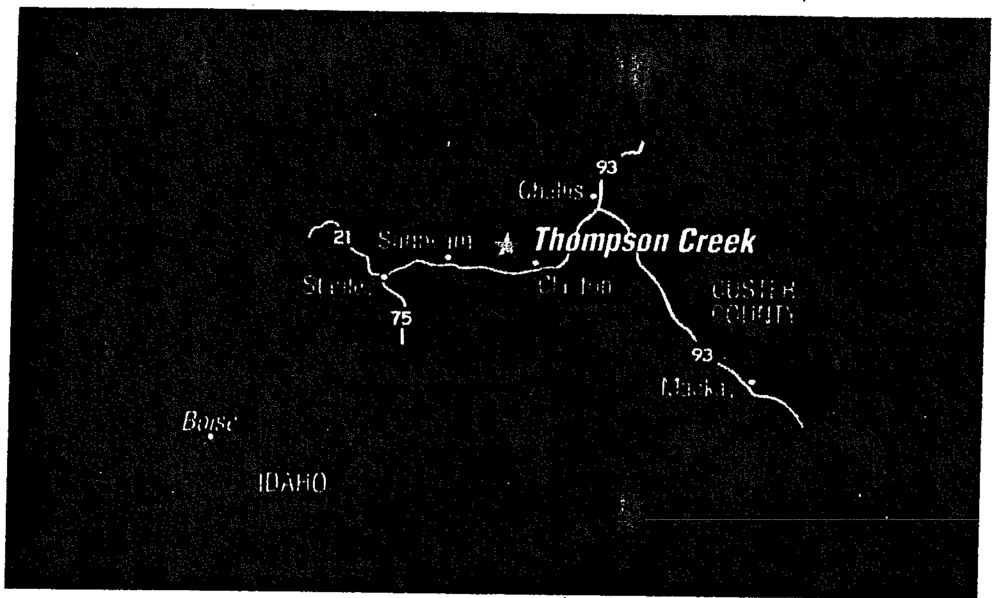

Figure 1 Facility Location

The facility is located within a 15 square mile claim block straddling the boundary between Challis National Forest to the north and lands administered by the Bureau of Land Management to the south. A facility plot and topographic patent claim plans are located in the Appendices of this document. The facility is approximately five miles north of the Salmon River, 14 miles northwest of Clayton (population 90), and 40 miles southwest of Challis (population 1000). The mine area is situated in rough terrain at elevations near 8000 feet and the mill is approximately 1.5 miles southeast of the mine at an elevation of 7550 feet.

3 Mineral Project General Description

This section presents a general description of the Thompson Creek Mining Company's molybdenum mining and concentrating operation. This narrative description of the facility explains the air pollution sources and how each source is associated with the facility operations. A process flow diagram is included in the Appendices.

3.1 Introduction

The Thompson Creek Mining Company operates an open pit molybdenum mine and concentrator in central Idaho. The operation produces 15-20 million pounds of molybdenum disulfide (MoS_2) per year. The operation involves a wide range of support facilities in addition to the actual mining and mineral-processing activities. The support facilities include maintenance shops, warehouses and change-houses, as well as provisions for water supply, solid waste disposal, sewage treatment, road gravel crushing and power transmission and distribution. The following sections provide a brief background description of the ore extracting and processing methodology whereby molybdenum is produced in a concentrated, saleable form. The basic steps described herein include:

- Mining the ore.
- Crushing and grinding the ore.
- Separating the valuable mineral by 'flotation', a concentration process carried out in a water medium.
- De-watering, drying, packaging and shipping the obtained concentrate.
- Discharging the final 'tailings' (a solids/liquid mixture) into a tailings impoundment area, and reclamation.

Two types of MoS_2 concentrate are produced at the Thompson Creek Mine, concentrate grade and lubricant grade. Concentrate grade is shipped off-site for further refining, mainly roasting. Concentrate grade leaves the Thompson Creek Mine at approximately fifty to fifty-eight percent Mo (eighty-three to ninety-six percent MoS_2). After roasting, this material is used as an alloy in steel production and trace amounts are used in pharmaceutical and food products. To produce lubricant grade, the MoS_2 concentrate goes through additional processing steps to produce a higher purity product. Lubricant grade is shipped directly to customers for use in various lubricant products with very little or no further refining. This high purity product leaves the Thompson Creek Mine at approximately ninety-eight percent or higher MoS_2. The production steps involved in producing each product are discussed in the sections below.

3.2 Mining

The two conventional hard rock mineral extraction methods are 'underground' and 'open-pit' mining. Open-pit mining is employed by Thompson Creek. The first step in this method is the removal of overlying waste material, or 'overburden', to expose the ore. Both the overburden and ore must be drilled and blasted so that the broken rock can be excavated with 25 yard electric shovels and hauled away in 150 ton haul trucks. Ore is defined as material having an assay result of 0.05 percent MoS_2 or higher.

Overburden removal and ore mining includes the following operations:

- Drilling, sampling and assaying to closely define the grade of the material to be mined,
- Blasting to fragment the ore (About 10,000 tons per year of explosive will be consumed.), and
- Loading with 25-yard electric shovels.

89919 ICCU3 651301

1. Road material for winter use - located in one spot.
o Pioneer Crusher

3.3 Crushing and Grinding

The broken ore excavated from the mine is reduced in size from rocks ranging greater than 8 inches to fine sand to powder in the crushing and grinding steps. The valuable mineral particles are released from the surrounding material and are then ready for subsequent separation and recovery.

Mined ore is delivered from the mine via haul trucks to the primary crusher located at an elevation of about 7250 feet. During crushing, the mined ore is reduced in size from 24 inches or greater in diameter to less than 8 inch; grinding then reduces the 8-inch material to a fine powder. Conventional crushing is a dry process carried out without water. In the primary crusher, one conical head gyrates within a larger stationary cone to provide the crushing action. The emissions from the primary crusher are controlled with a baghouse and vented to the atmosphere through a single stack (Primary Crusher Stack).

Crushed ore is then transported overland by a 60-inch belt conveyor to the concentrator, which is situated about 7200 feet southwest at an elevation of about 7500 feet. The overland conveyor system has a transfer point with additional belt drives to facilitate the uphill movement of the ore. This transfer is located in the Drive 1 building and the emissions are controlled with a baghouse and vented to the atmosphere through a single stack (Overland Conveyor Stack).

The ore is dropped from the overland conveyor at the mill ore stockpile. Two apron feeders, the East and West Ore Feeders, then transfer the ore from the bottom of the stockpile into the grinding process in the concentrator. Emissions from each ore feeder are controlled with individual wet venturi scrubbers and vented to the atmosphere through corresponding stacks (East Ore Feeder Stack and West Ore Feeder Stack). The scrubber blow-down water is recycled in the grinding circuit described below.

Grinding is normally a 'wet' operation where water is added to the crushed ore. Grinding is completed in two stages. The first stage is semi-autogenous grinding (SAG) where ore is fed to a rotating drum and the ore itself is the primary grinding media. At times, large steel balls are added to the SAG mills to aid in grinding when the ore is not hard enough to function as a self grinding medium. The second stage is ball milling, where ore is fed to a rotating drum containing steel balls as the grinding media.

3.4 Flotation Concentration

The slurry mixture of finely ground ore and water from the grinding mills next passes to the flotation step wherein the valuable mineral is separated from the waste materials. When mineral particles are coated with certain surface-active chemicals, they will preferentially attach themselves to air bubbles. In a series of mechanically agitated cells, flotation is accomplished by bubbling air through the slurry. Chemical reagents are added at this stage. Some of the reagents promote frothing so the desired mineral floats up with the froth bubbles, while other reagents depress certain minerals and waste so as to minimize their tendency to float. The process is called flotation concentration. At Thompson Creek, only one mineral, MoS_2, is recovered.

Additional concentration steps are sometime required to meet customer grade requirements. When required, leaching is used to remove certain metals from the concentrate. Hydrochloric acid is used in leaching metals from lower grade material. Fumes from the leach plant are controlled by a caustic fume scrubber. Emissions from the scrubber are vented to the atmosphere through a single stack (Leach Fume Scrubber Stack).

3.5 Concentrate Grade Production

The separated concentrate slurry (solids/water mixture) flows to a thickener in which the solids are allowed to settle to the bottom and excess water is decanted from the top of the thickener tank. In this step the solids concentration is increased from 30-35% to 50-60%. The denser slurry is then pumped from the bottom of the thickener to a filter, which further removes water through a cloth medium. The wet filter cake is dried by the Holo Flite Dryer #1 to a low moisture content dictated by shipping and marketing considerations usually ranging 5-8% water. The Holo Flite dryer indirectly heats the wet MoS_2 concentrate using a hot oil thermo-screw conveyor. After drying, the concentrate grade material is packaged for shipping. The water removed during the thickening and filtering step is recycled for use in the grinding and flotation steps. Emissions from the Holo Flite Dryer #1 are controlled by a wet venturi scrubber and then by an electrostatic precipitator and vented to the atmosphere through a single stack (Holo Flite Dryer #1 Stack). The scrubber blow-down water is recycled for use in the grinding and flotation steps.

3.6 Lubricant Grade Production

Lubricant grade MoS_2 concentrate or High Purity Molybdenum (HPM) material in produced by running the MoS_2 concentrate slurry through advanced flotation and cleaning processes. The final concentrating process involves using column cleaners and the resulting HPM slurry is transferred to stock tanks. From these stock tanks, the HPM slurry is dewatered in a filter press and then moved by screw conveyor to the Holo Flite dryer #2. The Holo Flite dryer indirectly heats the wet HPM using a hot oil thermo-screw conveyor. Water and some diesel are removed from the HPM. From the Holo Flite #2 the material is screw-conveyed to the electrically-heated rotary kiln dryer where most of the remaining diesel is removed. Each dryer can process 1,253 pounds of material per hour. Emissions from each of these dryers are controlled individually by a wet venturi scrubber and then the emissions are combined in one duct and controlled by an electrostatic precipitator and vented to the atmosphere through a single stack (Lube grade Dryer Stack). The scrubber blow-down water is recycled for use in the flotation steps.

The dried HPM may be processed and packaged into five different grades:

1. Large Particle HPM;
2. A Grade;
3. Tech Grade;
4. Tech Fine Grade; and
5. Super Fine Grade.

Annual production of HPM is 5,488.14 tons per year combined for all five grades. The equipment and process involved in producing each grade is summarized below:

- **Large Particle** - HPM is conveyed via a bucket elevator from the rotary kiln to the tech fine packaging bin at a rate of 1,253 pounds per hour. This material is graded as "large particle HPM" and is packaged from the tech fine packaging bin. Emissions from the tech fine packaging bin are controlled by the tech fine packaging baghouse. The tech fine packaging baghouse is also referred to as the "fugitive collector baghouse" by Mill operations personnel; however, this baghouse does not collect fugitive emissions. This baghouse is vented to the atmosphere by a single stack (Tech Fine Packaging Baghouse Stack) and the captured material is kept in the system.
- **Grade A** - HPM is conveyed via a bucket elevator from the Holo Flite dryer #2 to the tech fine packaging bin at a rate of 1,253 pounds per hour. This material is the only HPM not dried in rotary kiln and is graded as "A Grade." A Grade material is packaged from the tech fine packaging bin. Emissions from the tech fine packaging bin are controlled by the tech fine packaging baghouse. This baghouse is vented to the atmosphere by a single stack (Tech Fine Packaging Baghouse Stack) and the captured material is kept in the system.
- **Tech grade** – HPM is conveyed via a bucket elevator from the rotary kiln to the fully-enclosed jet mill feed bin to await size reduction in the jet mill. The jet mill micronizes the HPM by fluid energy (compressed air) resulting in "tech grade" material. To produce tech grade material, the jet mill runs at a process rate of 1,600 pounds per hour. The tech grade material is then pneumatically conveyed through the jet mill baghouse into the tech fine packaging bin at a rate of 1,600 pounds per hour. The jet mill baghouse removes air from the tech grade material before it is deposited in

the tech fine packaging bin. The jet mill baghouse is vented to the atmosphere through a single stack (Jet Mill Baghouse Stack) and the captured tech grade material is kept in the system. Tech grade material is packaged from the tech fine packaging bin. Emissions from the tech fine packaging bin are controlled by the tech fine packaging baghouse. This baghouse is vented to the atmosphere by a single stack (Tech Fine Packaging Baghouse Stack) and the captured material is kept in the system.

- **Tech fine grade** – To produce tech fine grade material, HPM is passed through the jet mill at a lower process rate with more air pressure than is used to produce tech grade material. After jet milling, the resulting "tech fine grade" is then pneumatically conveyed through the jet mill baghouse into the tech fine packaging bin. The jet mill baghouse removes air from the tech fine grade material before it is deposited in the tech fine packaging bin. The jet mill baghouse is vented to the atmosphere through a single stack (Jet Mill Baghouse Stack) and the captured material is kept in the system. Emissions from the tech fine packaging bin are controlled by the tech fine packaging baghouse. This baghouse is vented to the atmosphere by a single stack (Tech Fine Packaging Baghouse Stack) and the captured material is kept in the system. Tech fine grade material is packaged from the tech fine packaging bin.
- **Super fine grade** – To make super fine grade HPM, a batch of tech fine grade is pneumatically conveyed from the jet mill through the jet mill baghouse to the super fine feed bin, also know as the pancake feed bin, at a feed rate of 850 pounds per hour. Emissions from the pancake feed bin are controlled by the pancake mill feed bin baghouse. This baghouse is vented to the atmosphere by a single stack (Pancake Mill Feed Bin Baghouse Stack) and the captured material is kept in the system. From the pancake feed bin, the tech fine grade is fed through two 12-inch, high-energy pancake mills set up in series. After pancake milling, the resulting "super fine grade" HPM is then transferred to the super fine packaging bin at a rate of 331 ponds per hour. Emissions from the super fine packaging bin are controlled by the super fine packaging bin baghouse. This baghouse is vented to the atmosphere by a single stack (Super Fine Packaging Bin Baghouse Stack) and the captured material is kept in the system. Super fine grade material is packaged from the super fine packaging bin. Annual production of super fine HPM is 1,450 tons per year.

3.7 Tailings Disposal

The tailings, waste rock and water slurry from the flotation cells, comprises 30-35% solids and is passed through a pipeline to the tailings impoundment area. The tailings flow initially by gravity, through a 24-inch diameter pipeline to the tailings impoundment 7,000 feet to the north. The pipeline is not buried. The tailings facility is located in the upper reaches of the Bruno Creek watershed. The ultimate crest of the tailings impoundment will be at an elevation of about 7600 feet. As the concentrator is located at an elevation of about 7550 feet, pumping of the tailings will be required.

It is normal practice to pass the slurry through 'cyclones'; a water/solid separation and particle size classification device based on centrifugal force. The coarse fraction or 'sands' is deposited on the periphery of the impoundment area, serving as embankment building material. The fine fraction or 'slimes', along with most of the water, is allowed to flow into the impoundment area, or 'tailings pond', where the solids settle to the bottom. Water is reclaimed from the tailings pond and pumped back to the grinding and flotation plant. This system achieves containment of both the solid tailings and the water used in the process. It is a 'closed' water system wherein the water and entrained reagents are continuously recycled.

In the unlikely event of a break in the pipeline, flow-sensing devices will alert the operator in the control room and allow him to shut down. In addition, the pipeline is patrolled on a regular basis to detect minor leaks. Any spillage will flow into a ditch paralleling the pipeline and service road, which will carry the slurry by gravity into the tailing impoundment via the seepage interceptor system.

The reclaim water system consist of pumps on a floating barge in the impoundment, which deliver the water by a 24-inch diameter pipeline to a 9 million gallon storage tank located above and near the concentrator. Water flows by gravity from the storage tank back to the concentrator.

The embankment is always maintained at a height sufficient to capture the maximum flood run-off-event from the area above the dam. The water reclaim system was designed to pump a maximum of 7750 gallons per minute.

The tailings impoundment is designed to accommodate at least 200 million tons of tailings. The starter embankment was constructed prior to the commencement of production using material from a borrow source. The main embankment is constructed from the coarse tailings obtained from the cyclones stationed along the starter embankment crest. The underflow from the cyclones is deposited downstream and mechanically placed and compacted by bulldozer to provide a slope of three horizontals to 1 vertical.

The impoundment area receives the fine particles from the cyclone overflow. Discharge points of the tailings are controlled to keep the water reclaim pool as remote as practicable from the embankment section. A water reclaim barge is located in the pond to pump water back to the concentrator.

Systems of blanket and finger drains were constructed within the embankment and at the foundation level to drain the embankment. Additionally some water seeps into the soils and rock underlying the embankment. To control the quality of water flowing downstream, two systems were constructed:

- Seepage return dam to capture surface water.
- A network of wells to monitor subsurface water around the impoundment area.
- Water from the settling pond is pumped back to the impoundment or directly to process water storage.

3.8 Reagents

Several reagents are used in the concentrator process. The table below lists these reagents.

Table 1 Reagent List

Reagent	Physical State	Use
1. Diesel Fuel	Liquid	Used as a molybdenum collector in floatation and added to the sag mill and ball mill.
2. NALCO Frother	Liquid	Used as a frother for floatation and add to the ball mills
3. Flocculent	Liquid	Used in the floatation thickeners to collect and sink particles.
4. Nokes	Liquid	Used in the cleaner circuit to depress cooper, lead, and iron.
5. Pebble Lime	Solid	Used mostly in floatation and leaching to control pH.
6. Rock Salt	Solid	Used in leaching to add chloride, this holds lead in solution during filtering process.
7. Ferric Chloride	Liquid	Used in leaching to remove gamma radiation from the final product.
8. Liquid Nitrogen	Liquid	Used in the HPM circuit to keep product from oxidizing during drying.
9. Mercaptobenzothiazole (MBT)	Solid	Used in pyrite flotation as an iron collector.
10. Caustic Soda	Liquid	Used in the leach fume scrubber to neutralize all of the acid fumes collected by the scrubber.
11. Isopropyl Alcohol (IPA)	Liquid	Used to liquefy MBT for use in the pyrite recovery circuit.
12. Hydrochloric Acid (HCL)	Liquid	Used in leaching to liquefy lead from lower grade material.

Pebble lime is delivered to the facility and pneumatically conveyed to the lime silo. Emissions from this transfer are controlled by a baghouse (Pebble Lime Baghouse) and vented to the atmosphere. The pebble lime is then mixed with water to form slurry and fed into the SAG mills, neutralization tank, or the tailings line.

4 Completeness Determination

COMPLETENESS DETERMINATION CHECKLIST AND APPLICATION INDEX

Company Name: Thompson Creek Mining Company

Location: Custer County, Idaho

Project:

Reviewer: Eric R Tilman **Date:** 3-30-06

The attached forms have been provided as a checklist and application index to ensure all the required information have been included with the air pollution source permit application. These forms shall be submitted along with the application. These checklist/index forms include the following elements of the permit application:

- **Application Forms**
- **Source Descriptions**
- **Source Flow Diagrams**
- **Plot Plans**
- **Emission Estimate References and Documentation**
- **Excess Emission Documentation**
- **Ambient Air Impact Analysis**
- **Compliance Certification Plan**

Each page of the permit application shall be numbered so that each page can be referenced individually. This will allow these checklist forms to act as the permit application table of contents.

APPLICATION FORMS

SECTION	SOURCE	LOCATION
1	GENERAL INFORMATION	Appendix C
2	FUEL BURNING EQUIPMENT	Appendix C
3	PROCESS AND MANUFACTURING OPERATIONS	Appendix C
4	WAST INCINERATION	NA
5	STORAGE AND HANDLING OF LIQUIDS	Appendix C
6	LOADING RACKS	NA
7	SOILD MATERIAL TRANSFORT, HANDLING, AND STORAGE	Appendix C
8	FUGITIVE SOURCES	Appendix C

	YES	NO
Is the application signed and dated?	X	
Are all the forms adequately completed?	X	

Figures

SOURCE DESCRIPTIONS

SOURCE	Location
General Facility Description	Sec 3
Source General Information	Appendix C
Processing Data	Appendix C

	YES	NO
Are the existing facilities described?	X	
Are the modifications or new facilities described?		NA
Are all applicable processes, materials, ventilation, and controls described?	X	
Are all equipment referenced by specific ID name or number?	X	

SOURCE FLOW DIAGRAMS

SOURCE	Location
Facility Process Flow Diagrams	Appendix B

	YES	NO
Are included?	X	
Shows entire existing facility?	X	
Shows entire future facility?	X	
Shows each process separately (if needed)?	X	
Details storage, roads, transfers, and processing?	X	
Labeling is adequate (processes and stacks identified, flow rates, and process rates shown)?	X	

PLOT PLANS

SOURCE	Location
Facility Plot Plan and Location Map	Appendix A

	YES	NO
Is included?	X	
Shows location coordinates?	X	
Shows plant boundaries?	X	
Shows neighboring ownership and facilities?	X	
Shows topography?	X	
Scale shown or distances adequately labeled?	X	
Shows all buildings, equipment, storage, and roads?	X	
Is adequate for both existing and future or includes both?	X	

EMISSION ESTIMATE REFERENCES AND DOCUMENTATION

SOURCE	Location
Production Data	Appendix C
Emission Factors	Appendix C
Emission Inventory	Appendix C
Emission Factor Documentation	Appendix C

	YES	NO
All fugitive and point sources listed?	X	
All pollutants addressed?	X	
Process documentation and specs included?	X	
Control equipment documentation and specs included?	X	
Emission factors documented and referenced?	X	
Calculations and assumptions shown?	X	
Source tests referenced (test includes processing and control device test conditions)?	X	

EXCESS EMISSION DOCUMENTATION

SOURCE	Location
Not Applicable (NA)	

	YES	NO
All three types of excess emissions (startup, shutdown, and scheduled maintenance) covered for each source?		NA
Calculations and documentation included?		NA
Expected frequencies of excess emissions noted?		NA
Justification for amounts and frequencies of excess emissions?		NA
Procedures for minimizing excess emissions covered?		NA

AMBIENT AIR IMPACT ANALYSIS

PROJECT	Location
Existing ambient air quality discussion including attainment status and classification of areas which may be significantly impacted.	Appendix D
Discussion of dispersion model use and assumptions.	Appendix D
Dispersion model input.	Appendix D
Dispersion model output.	Appendix D
Discussion of ambient impacts for each pollutant.	Appendix D
Discussion of how excessive impacts will be controlled or avoided for sources and pollutants with the potential for these.	Appendix D

COMPLIANCE CERTIFICATION PLAN

SOURCE	Location
Not Applicable (NA)	

	YES	NO
Monitoring, recordkeeping, and reporting discussed?		NA
Stack testing methods thoroughly documented?		NA
Discussion and documentation of process control mechanisms used to meet emission limits?		NA
Quality assurance/quality control discussed?		NA
Monitoring equipment specifications and documentation included?		NA

5 Appendices

Appendix A Facility Plot Plan

Figure 2 Facility Plot Plan

Note:
Please refer to Figure 1 for facility location. Please refer to Appendix D for contour drawings.

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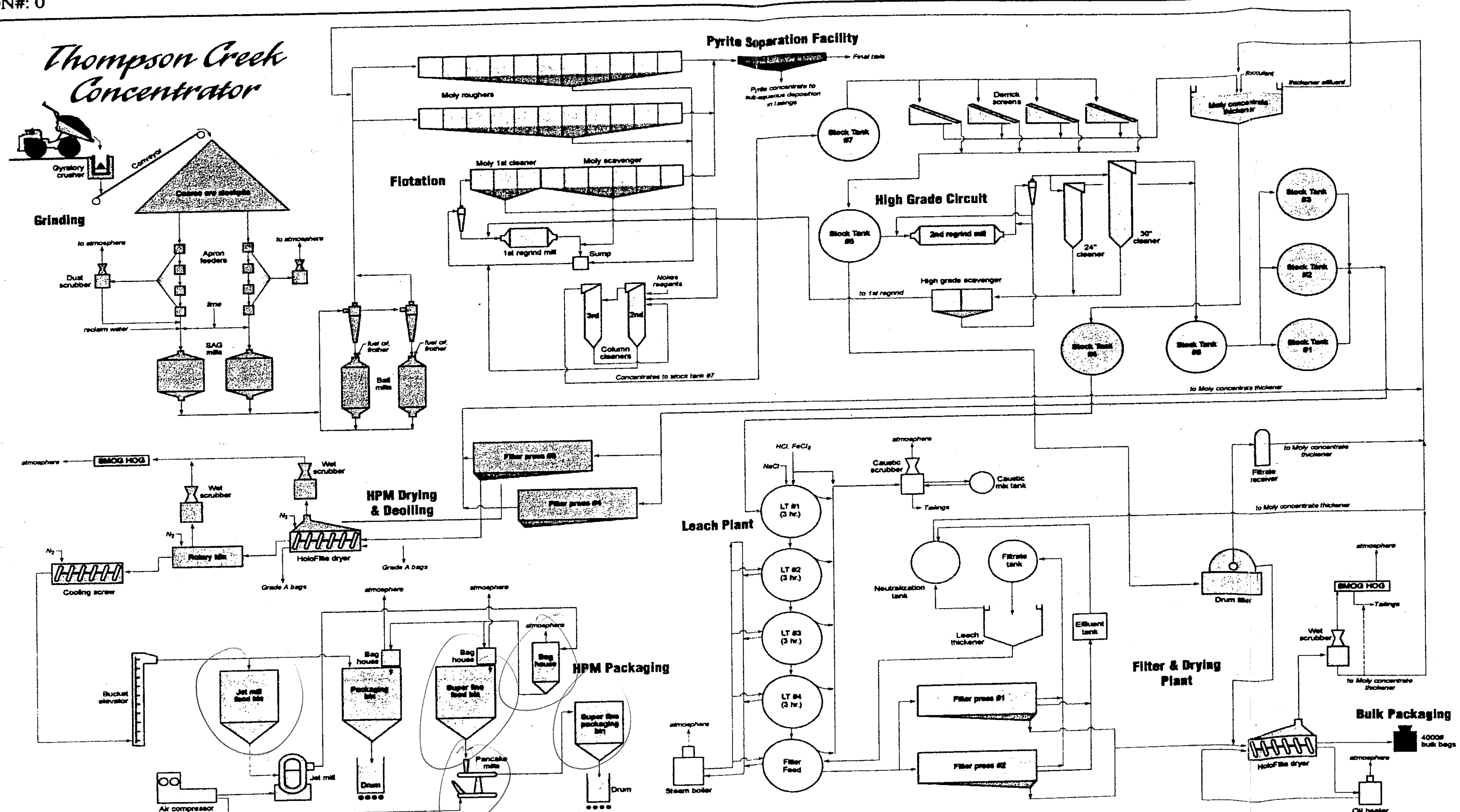
List of Tables



PREPARED BY:	DATE:	AUTHORIZED BY:	DATE:	APPROVED BY:	DATE:

1 Introduction

On behalf of Thompson Creek Mining Company (TCMC), The RETEC Group, Inc. (RETEC) is submitting this air quality impact analysis in support of TCMC's Tier II Operating Permit renewal application to the Idaho Department of Environmental Quality (IDEQ). This report defines the regulatory framework and technical methods that were used for the air quality impact analysis, as well as the results of the analysis.

TCMC operates the Thompson Creek Mine, which is a molybdenum disulfide mining, milling, and concentration facility located near Clayton, Idaho in Custer County. The facility currently operates under Tier II Operating Permit No. 037-00001.

TCMC has retained the services of RETEC to conduct the dispersion modeling analysis required to support their Tier II permit renewal application. This document describes the technical approach used for the required air quality dispersion modeling impact assessment portion of the permit renewal application. The modeling strategy is intended to provide conservative estimates of ambient concentrations that may potentially result from emissions from the Thompson Creek Mine facility.

The air quality modeling was conducted and this document was prepared in accordance with guidance provided by the United States Environmental Protection Agency (USEPA) and the IDEQ as outlined in the following documents:

- State of Idaho Air Quality Modeling Guideline (IDEQ, 2002)
- *Guideline on Air Quality Models* [published as 40 CFR 58, Appendix W] (EPA, 2005) (hereafter referred to as the *Modeling Guideline*)
- *New Source Review Workshop Manual: PSD and Nonattainment Area Permitting* (EPA 1990) (hereafter referred to as the *Workshop Manual*)

RETEC used USEPA- and IDEQ-approved dispersion models and methods described in the above reference documents to perform the modeling analyses. Copies of all model input and output files, the meteorological input file, and various spreadsheets used to process the model output, can be found on the CD-ROM in Appendix B.

A modeling protocol was provided to IDEQ via e-mail on March 13, 2006 (RETEC, 2006). The modeling protocol was approved, with comments, on March 23, 2006 (IDEQ, 2006). A copy of the approval is provided in Appendix A.

2 Technical Approach and Model Inputs

2.1 Regulatory Issues

IDEQ has requested that TCMC submit an ambient air quality impact assessment to support their Tier II operating permit renewal application. IDEQ permit and modeling guidance requires that an analysis of compliance with the National Ambient Air Quality Standards (NAAQS) for NO_x, SO_2, CO, and PM_{10} be performed in support of the permit renewal application.

2.2 Facility Description

TCMC mines molybdenite (molybdenum disulfide, MoS_2) from an open pit mine near Clayton in central Idaho (see Figure 1). The mine site is located in an area of high mountain ranges, and numerous lakes, streams, and valleys near the Salmon River and its tributaries, which flow through the lower elevations. Elevations range from 5,500 feet at the Salmon River to 9,487 feet near the mine site. The active facility is located on mixed ownership land including: private land, Bureau of Land Management (BLM) administered Federal land, and USFS administered Federal land. TCMC also controls a mineral claim block around the Thompson Creek Mine (USEPA, 1992).

The mine is located in Custer County, approximately 35 miles southwest of Challis, the county seat of Custer County. The nearest town is Clayton, which has a population of about 26 (2003 Census data) and is approximately 12 miles from the site. Access to the mine site is from State Highway 75, along an unpaved county road that generally parallels Squaw Creek. The road crosses Squaw Creek, first west to east about 1.5 miles from its intersection with State Highway 75 and from east to west about 4 miles from the intersection (USEPA, 1992).

2.3 Emission and Source Data

2.3.1 Facility Emission Units (EUs)

Emission units currently permitted at the facility primarily consist of a portable crushing operation with associated screens and conveyors, a primary crusher, an overland conveyor, ore feeders, dryers, kilns, storage bins, small boilers, and emergency generators.

A list of all permitted EUs, including emission rates and release parameters, is provided in Table 1 through Table 3. These tables include both actual physical parameters as well as modeled parameters. Emission rate calculations for all modeled EUs are provided in the operating permit renewal application.

Point Sources

Point sources such as combustion and baghouse exhausts were modeled using source parameters provided by the equipment manufacturer or by TCMC. Source locations and base elevations were obtained from TCMC.

In cases where the exit temperature is ambient, the modeled exit temperature was set to 0°K, which allows the ISC3 model to simulate a non-buoyant release.

Volume Sources

Volume sources include the portable crushing operation, and conveyor and truck dump drop points.

The initial lateral dimension of the portable crushing operation was set equal to a typical length of a volume that encloses crusher loading, conveying, and screening operations. The initial lateral dimension was scaled by 4.3, which is the appropriate scaling factor for a single volume source (USEPA, 1995).

The initial vertical dimension of the portable crushing operation was set equal to a typical height of a volume that encloses crusher loading, conveying, and screening operations. Prior to input to the model, the initial vertical dimension was scaled by 2.15, which is the appropriate scaling factor for a surface-based source (USEPA, 1995).

The release height of the portable crushing operation was set equal to zero to simulate a surface-based release.

The initial lateral dimension of all drop point volume sources were set to the approximate width of the dropped material stream. The initial lateral dimension was scaled by 4.3, which is the appropriate scaling factor for a single volume source (USEPA, 1995).

The initial vertical dimension of all drop points was set equal to the distance that material falls to another conveyor, process, or the ground, depending on the source. Prior to input to the model, the initial vertical dimension was scaled by 4.3, which is the appropriate scaling factor for an elevated source not on or adjacent to a building (USEPA, 1995).

The release heights of all drop points were set equal to midpoint of the material drop. For example, the typical height of the mill stockpile is approximately 204 ft, while the typical distance that material drops from the ore conveyor to the top of the pile is typically 35 ft. Therefore, the release height was set equal to 222 ft.

<u>**Other Fugitive Emission Sources**</u>

Fugitive emissions from sources such as haul road, drilling, blasting, grading/bulldozing, mobile equipment combustion, and wind erosion from storage piles were not modeled due to a reasonably high level of emissions control through implemented measures and the high degree of variability and uncertainty of emissions estimations for these types of sources (IDEQ, 2005).

2.3.2 Off-Site Sources

The Thompson Creek mine is located in a rural area with no nearby large stationary sources. Therefore, no off-site sources were included in the model analysis. Potential off-site source impacts in the vicinity of the mine were considered to be accounted for by using representative background ambient air quality concentrations (see Section 2.10).

2.4 Model Selection

Selection of the appropriate dispersion model for use in the analysis was based on the available meteorological input data, the physical characteristics of the sources that are to be simulated, the land use designation in the vicinity of the facility, and the complexity of the nearby terrain.

RETEC used the current version of the USEPA-approved Industrial Source Complex Short-Term model (ISC3 dated 02035) to meet the dispersion modeling requirements for this analysis. ISC3 is recommended for use in modeling multi-source emissions, and can account for plume downwash, stack tip downwash, and point, area, and volume sources (USEPA 1995; 2005). ISC3 also has the ability to model impacts at both simple (below stack height) and complex (terrain heights above the height of the stack) terrain receptors.

The ISC3 model output file identifies those source-receptor combinations that fall inside the cavity region of any structures. The cavity region is the turbulent region immediately adjacent to a structure where recirculation in the air flowing over and around the structure may occur. An assumption built into the plume downwash algorithm in the ISC3 model is that the cavity region extends to a distance of three times the lesser of the projected structure height or width downstream of the structure (USEPA, 1995); therefore, the ISC3 model will not calculate concentration values for receptors located in the cavity region of any structure. The model output files were examined to verify that there were no receptors located inside a cavity region.

The model code was recompiled using the Lahey Fortran 95 Release 5.70f compiler to increase execution speed. The resulting executable code is provided on the CD-ROM found in Appendix B.

Note that on December 9, 2005 the American Meteorological Society/EPA Regulatory Model (AERMOD) was promulgated as a replacement model for ISC3. However, the USEPA allowed a one-year transition period during which protocols for modeling analyses based on ISC3, which are submitted in a timely manner, may be approved at the discretion of the appropriate Reviewing Authority. Since the TCMC operating permit renewal application is being submitted in spring 2006, well within the one-year transition period, the ISC3 model was approved for this permit renewal application (IDEQ, 2005).

2.5 Model Input Options

Model input options were set to their regulatory default values.

2.6 Stack Tip Downwash for Horizontal or Capped Stacks

Horizontal or capped stacks were modeled following guidance found in IDEQ (2002). The exit velocity for these stacks was set to 0.001 m/s to minimize momentum plume rise, thereby simulating a horizontal or capped stack in the modeling analysis.

For vertical stacks that are capped, the stack tip downwash option was turned on and the stack diameter was set equal to the actual stack diameter. For horizontal stacks, the stack tip downwash option was turned on and the stack diameter was set to 0.001 meters to prevent stack tip downwash effects. The original stack dimensions (height and diameter), as well as the modified stack dimensions, are provided in Table 2.

2.7 Plume Downwash

The effects of plume downwash were considered for all Thompson Creek Mine point sources. Direction-specific building dimensions were calculated using the current version of the USEPA-approved Building Profile Input Program (BPIPPRM Version 04274). Dimensions for those structures that may potentially produce plume downwash were obtained from drawings of the structures, geo-referenced aerial photographs, and by best estimation.

In addition to calculating direction-specific building dimensions, the BPIP program also calculates the Good Engineering Practice (GEP) stack height. All Thompson Creek Mine facility stack heights were checked to verify that they are within the GEP stack height limit.